HOMEWORK 1

MATH 2135

SEBASTIAN CASALAINA

ABSTRACT. This is the first homework assignment. The problems are from Hammack [Ham13, Ch. 12, §12.1–5]:

- **Chapter 12 Section 1**, Exercises: 4,6.
- **Chapter 12**, **Section 2** Exercises: 5,10,16.
- **Chapter 12**, **Section 4** Exercises: 2,6,10.
- **Chapter 12**, **Section 5** Exercises: 2,8.

In the future, we will do exercises out of [LLM16].

CONTENTS

Date: January 19, 2021.
I would like to take this opportunity to thank my class for their support. I collaborated with John Doe on this assignment.

CHAPTER 12 SECTION 1

Exercise 12.1.4. There are eight different functions $f : \{a, b, c\} \to \{0, 1\}$. List them. Diagrams suffice.

Solution. [1] The eight different functions $f : \{a, b, c\} \to \{0, 1\}$ are described by the table below.

	a	b	c
$f_1(x)$	0	0	0
$f_2(x)$	0	0	1
$f_3(x)$	0	1	0
$f_4(x)$	0	1	1
$f_5(x)$	1	0	0
$f_6(x)$	1	0	1
$f_7(x)$	1	1	0
$f_8(x)$	1	1	1

For instance, $f_1(x) = 0$ for all $x \in \{a, b, c\}$, and we have $f_2(a) = f_2(b) = 0$, while $f_2(c) = 1$. □

Exercise 12.1.6. Suppose $f : \mathbb{Z} \to \mathbb{Z}$ is defined as $f = \{(x, 4x + 5) : x \in \mathbb{Z}\}$. State the domain, codomain, and range of f. Find $f(10)$.

Solution. The domain (or source) of $f : \mathbb{Z} \to \mathbb{Z}$ is $\mathbb{Z}$. The codomain (or target) is also $\mathbb{Z}$. The range (or image) of f also happens to be $\mathbb{Z}$, since for any $y \in \mathbb{Z}$ we have that $y = f\left(\frac{y-5}{4}\right)$. Finally, we have $f(10) = 4(10) + 5 = 45$.

In summary, we have

Domain (source) :	$\mathbb{Z}$
Codomain (target) :	$\mathbb{Z}$
Range (Image) :	$\mathbb{Z}$
$f(10) = 45$	

□

[1] I worked on this problem with the entire class. You are encouraged to work together on homework assignments. However, for each problem you must write your own solution, you must indicate with whom you worked, and you must cite any resources you used in solving the problem.

CHAPTER 12 SECTION 2

Exercise 12.2.5.

Solution. □

Exercise 12.2.10.

Solution. □

Exercise 12.2.16.

Solution. □

CHAPTER 12 SECTION 4

SOME LATEX EXAMPLES THAT MIGHT BE USEFUL

$$\begin{aligned} x^3 + 5x^2 = -6x &\iff x^3 + 5x^2 + 6x = 0 \\ &\iff x(x^2 + 5x + 6) = 0 \\ &\iff x(x+2)(x+3) = 0 \\ &\iff x = 0, \text{ or } x = -2, \text{ or } x = -3. \end{aligned}$$

Therefore,

$$\{x \in \mathbb{R} : x^3 + 5x^2 = -6x\} = \{0, -2, -3\}.$$

Theorem A. *The theorem*

1. THE FIRST SECTION

[AM69]

(1.1)
$$\begin{array}{ccc} X & \xrightarrow{f} & Y \\ {\scriptstyle\pi}\downarrow & \nearrow & \\ Z & & \end{array}$$

$$\begin{array}{ccc} \mathscr{A} & \xrightarrow{f} & B \\ \| & & \\ C & \longrightarrow & D \end{array}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$$

This is the full version

REFERENCES

[AM69] M. F. Atiyah and I. G. Macdonald, *Introduction to commutative algebra*, Addison-Wesley Publishing Co., Reading, Mass.-London-Don Mills, Ont., 1969. MR 0242802 (39 #4129)

[Ham13] Richard Hammack, *Book of proof*, Creative Commons, 2013.

[LLM16] David Lay, Stephen Lay, and Judi McDonald, *Linear Algebra and its Applications*, Fifth edition, Pearson, 2016.

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